Southern Connecticut State University
SC SU

Basic Flight Proficiency

Following are a series of flight routines you can practice on your way to mastering sUAS piloting.

1. Hover At Eye-Level
2. Hover & Yaw
3. Out & Back
4. “T” Shape
5. Target
6. Square
7. Circle
8. Square Yaw
9. Bird’s Eye
10. Orbit

* Advanced

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Basic Flight Proficiency

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The following practice flight operations/routines are for those who have never flown a multirotor system before, or are just beginning.

FYI: unlike in other countries, in the USA, the FAA does not require you to demonstrate flight proficiency as part of their Part 107 certification process... so you can be a certified Remote Pilot without ever proving you know how to fly a sUAS.

In this "Drone Academy" we will hold you all to a higher standard and provide specific training and opportunities to gain further sUAS flight operation and Piloting skills.

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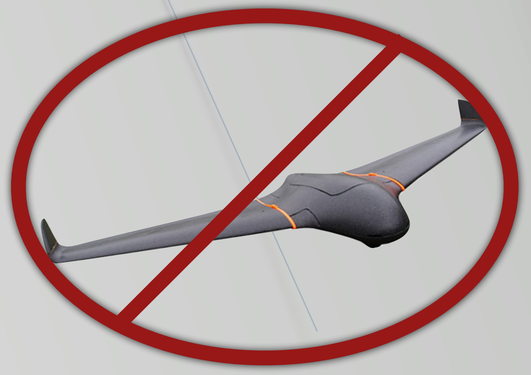
Basic Flight Proficiency

The following 10 practice flight sequences you can practice on your way to mastering sUAS piloting.

Unfortunately due to airspace restrictions, we will not be covering fixed-wing aircraft in these Academy flight training/practice scenarios.

We will be covering multirotor systems: quadcopters, hexacopters and octocopters — and using a dual joystick transmitter to thrust, pitch, roll and yaw the aircraft around the skies.



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Basic Flight Proficiency

We may also demonstrate some of our DJI Mavic Pro's more advanced flight modes including some autonomous/intelligent features that rely on GPS and other sensors like Return-to-Home, Active Track, Spotlight, Point-of-Interest, Waypoints, and others...

- *you can always look to YouTube for lots of tutorials on these maneuvers.*

However.... We strongly suggest that you learn and practice basic manual flight before engaging these autonomous flight modes.

It's also a good idea to spend some time with a "flight simulator". You can log these simulated flights also....

**Remember.... always record your flight operations in your Logbook, including practice flights. Begin now to establish this Best and Necessary Practice!*

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Here are our Basic Flight routines

1. Hover At Eye-Level
2. Hover & Yaw
3. Out, Back & Land
4. “T” Shape, Out & Back
5. Target Practice
6. Square Pattern
7. Circle Pattern
8. Square Pattern
9. Bird’s Eye View
10. Orbit

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Here are our Basic Flight routines

1. *Launch & Hover @ Eye-Level*
   - *Either use the "auto take off" button on the remote (upper left of screen) then slide to take off and hover.... or, Pin the thumb stick controls down and slightly inward to start the props, then push left stick up to take off.*
2. *Hover over "home point", remain hovering for 15 seconds at ~1.5m above ground.*
   - *This is good to do in a any/all flight operations*
   - *By hovering over the home point you allow the GPS and downward-looking cameras to record the "home point", which is critical for any "Return-to-Home" emergency.*
3. *Land, by pulling the left stick down and holding it firm until the props stop spinning.*

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Here are our Basic Flight routines

2. Hover & Yaw

- Launch and Hover (as before)
- Yaw in place, clockwise rotation (left stick “left”)
- Yaw in place, counterclockwise rotation (left stick “right”)
- Land, as before.

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Here are our Basic Flight routines

3. Out, Back & Land

- Launch and Hover(as always)
- “Right stick” forward (Pitch), sUAS moves ~25-30 ft. out
- “Right stick” backward, sUAS returns
- Land.

Stop and Hover Distant point.

Launch, Hover and Land
Home point.

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Here are our Basic Flight routines

4. “T” shape Out & Back

- Launch and hover
- forward straight out (right stick forward),
- Yaw left 90^{o} (left stick to left),
- forward to left T end,
- Yaw 180^{o} (left stick to left or right),
- forward to right T end,
- Yaw 180^{o} (left stick to left or right),
- forward to T center,
- Yaw 90^{o} (left stick to left),
- return to home,
- Yaw 180^{o} so camera faces away,
- Land.

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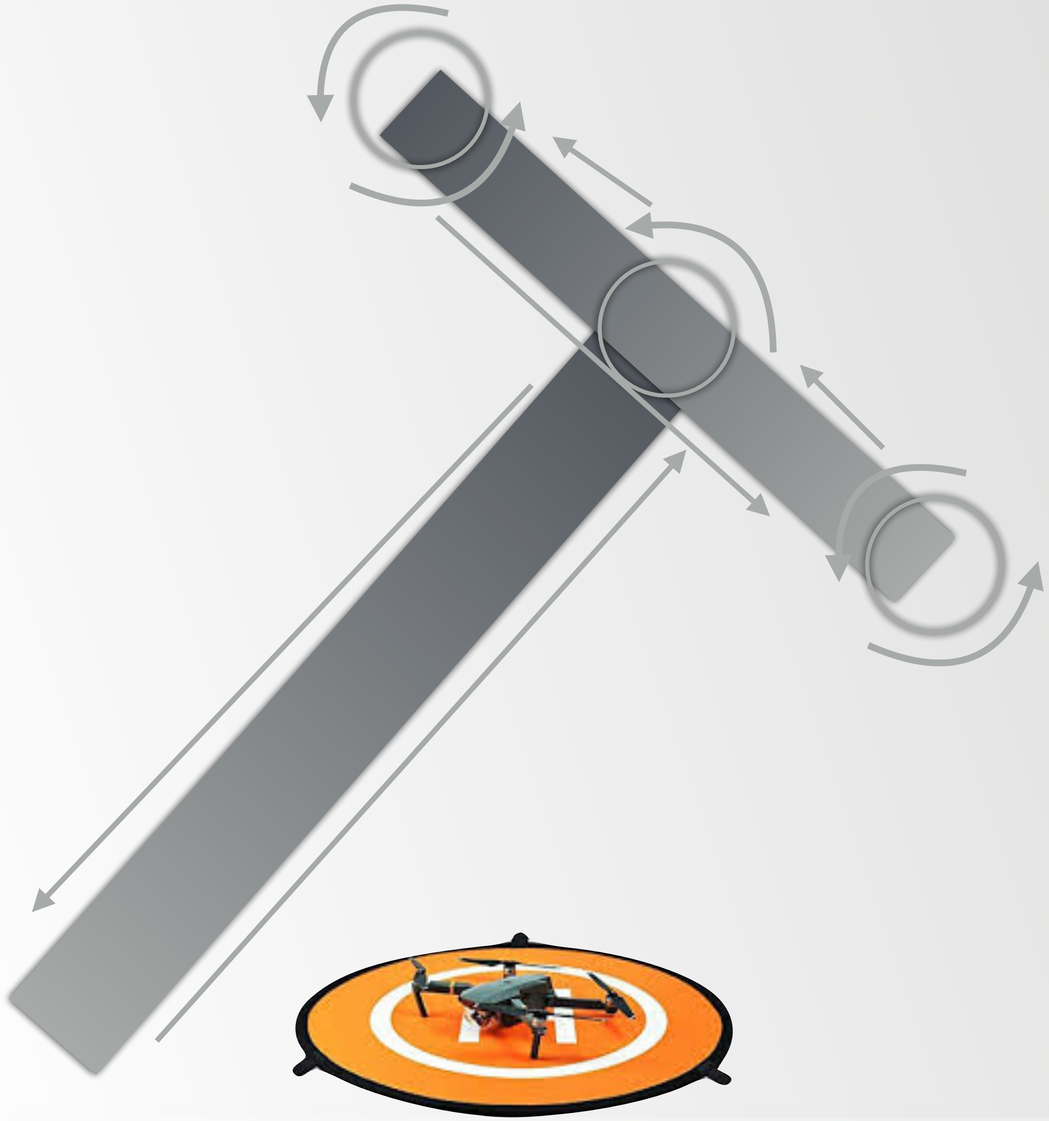
Here are our Basic Flight routines



4. *"T" shape Out & Back*
   - *Launch and hover*
   - *forward straight out (right stick forward),*
   - *Yaw left 90° (left stick to left),*
   - *forward to left T end,*
   - *Yaw 180° (left stick to left or right),*
   - *forward to right T end,*
   - *Yaw 180° (left stick to left or right),*
   - *forward to T center,*
   - *Yaw 90° (left stick to left),*
   - *return to home,*
   - *Yaw 180° so camera faces away,*
   - *Land.*

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Here are our Basic Flight routines

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5. Target Practice *(take off from one point, land in another)*

- *Launch and Hover (as always, but this time at a distance),*
- *Yaw and Pitch to head to "target" landing site,*
- *Land.*

Launch, Hover.

Pitch forward to second position.

Stop and Hover Distant point. Land.

Return, same procedure.

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Here are our Basic Flight routines

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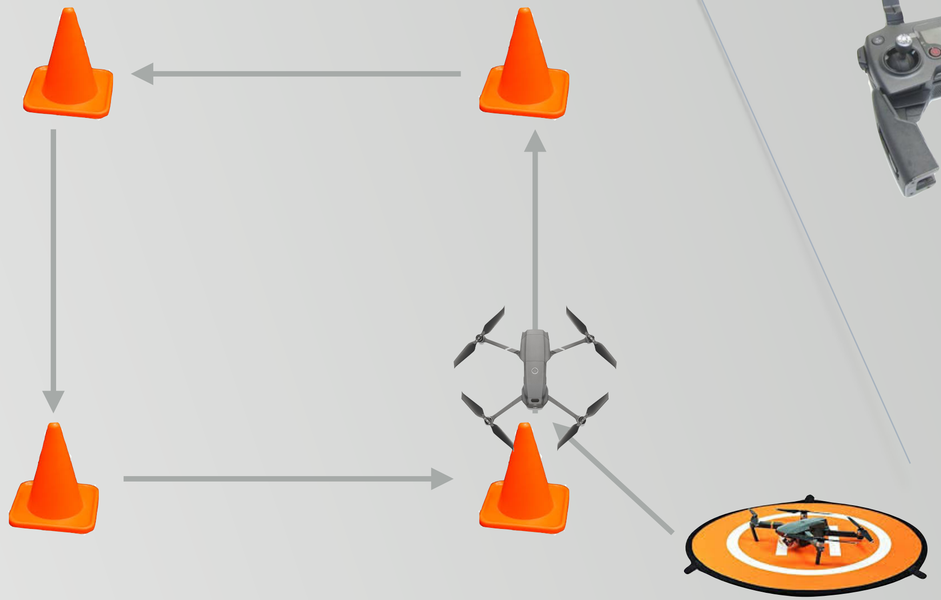
6. Square Pattern (fly directly over corner Cones, no Yaw)
   - Launch and Hover (as always, but this time at a distance),
   - Yaw and Pitch to head to first Cone,
   - try to fly directly over Cones,
   - don't worry about Yawing over Cones,
   - Roll Left or Right to head to next Cone,
   - Roll or Pitch to head to third Cone,
   - Roll or Pitch to head to last Cone,
   - Return to landing site,
   - Land.



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Here are our Basic Flight routines

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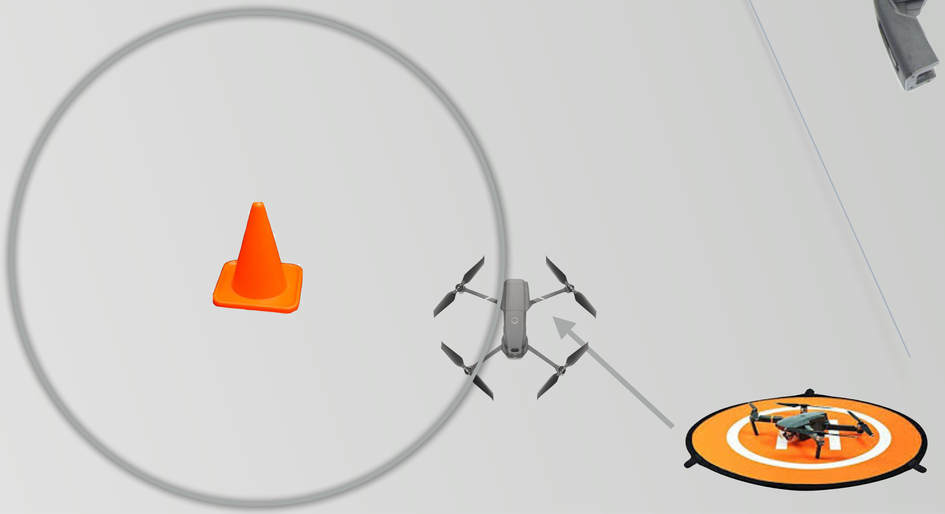
7. Circle Pattern *(fly Around center Cone, no Yaw)*

- *Launch and Hover (as always, but this time at a distance),*
- *Pitch forward to "starting position",*
- *Don't worry about Yawing*
- *Use "Right stick" to Pitch and Roll as you negotiate a Circle around center Cone,*
- *Return to landing site,*
- *Land.*



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Here are our Basic Flight routines

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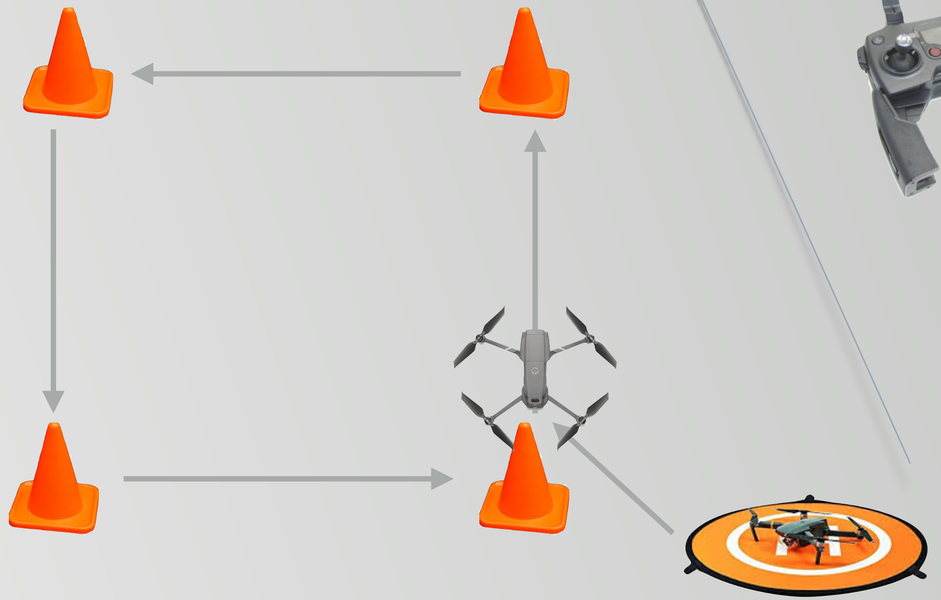
8. Square Pattern (with Yaw, over Cones)

- Launch and Hover (as always, but this time at a distance),
- Pitch forward to “starting position”,
- Yaw (“left stick”) to face first Cone,
- Use “Right stick” to Pitch toward first Cone - hover over cone,
- Yaw (“left stick”) to face next Cone,
- Pitch forward, and then hover over second Cone,
- Yaw (“left stick”) to face next Cone,
- Use “Right stick” to Pitch toward third Cone - hover,
- Yaw (“left stick”) to face final Cone,
- Right stick Pitch toward final Cone - hover,
- Return to landing site - Yaw to “face forward”,
- Land.



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Here are our Basic Flight routines

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9. Bird's Eye View (Elevated Yaw Panorama and Nadir View)

- Launch and Hover (as always, but this time at a distance),
- Click "Video Record",
- "Left stick" forward to Thrust Upward to 120 ft. elevation (AGL),
- Yaw ("left stick") gently/slowly to record Rotational Panorama,
- Use "Gimbal dial" to rotate Camera down to Nadir view - pause,
- "Left stick" back to slow propellers - Descend to eye level,
- Return to Landing site,
- Yaw to face camera forward,
- Land.

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Here are our Basic Flight routines

10. **Orbit** *(Manual Orbit entails Roll & Yaw)*

- *Launch and Hover (as always, but this time at a distance),*
- *Click "Video Record",*
- *Pitch forward to "Starting Position" ~ 20 ft. from center Cone,*
- *Roll Left (or Right) and Simultaneously Yaw to keep center Cone stationary,*
- *Keep Rolling/Yawing until a full Circle is achieved,*
- *Return to Landing site,*
- *Yaw to face camera forward,*
- *Land.*

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Here's a more Advanced Flight routine

11. Figure 8 (Manual flight around 2 Cones, Pitch, Roll & Yaw)
    - Launch and Hover (as always, but this time at a distance),
    - Click "Video Record",
    - Pitch forward to "Starting Position" ~ 20 ft. from first Cone,
    - Pitch and Roll toward second Cone - Simultaneous Yaw to circle second Cone,
    - Keep Pitching, Rolling & Yawing until second Cone is rounded,
    - Pitch and Roll toward first Cone - Simultaneous Yaw to circle Cone,
    - Repeat - Repeat - Repeat,
    - Return to Landing site,
    - Yaw to face camera forward,
    - Land.

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Here's a List of "Basic Cinematic Flight routines"

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1. Elevation Reveal (lift to reveal landscape/setting)
2. Reverse Elevation Reveal (dropping to reveal subject)
3. Line of Sight (forward or reverse or "overtaking")
4. Overtaking Line of Sight (passing over subject)
5 Rolling Panorama or Subject Tracking (from the side)
6. Yawing Panorama (rotational panorama)
7. Drone (like a selfie, but flying backwards and upwards)
8. Still (elevated or not, horizontal or nadir, stationary shot while subjects move in field of view)
9. Orbit (pitch, roll and yaw to circle subject)
10. Follow (pitch, roll, yaw to follow moving subject)
11. Combinations of those above... remember to Roll, Pitch & Yaw SMOOTHLY.

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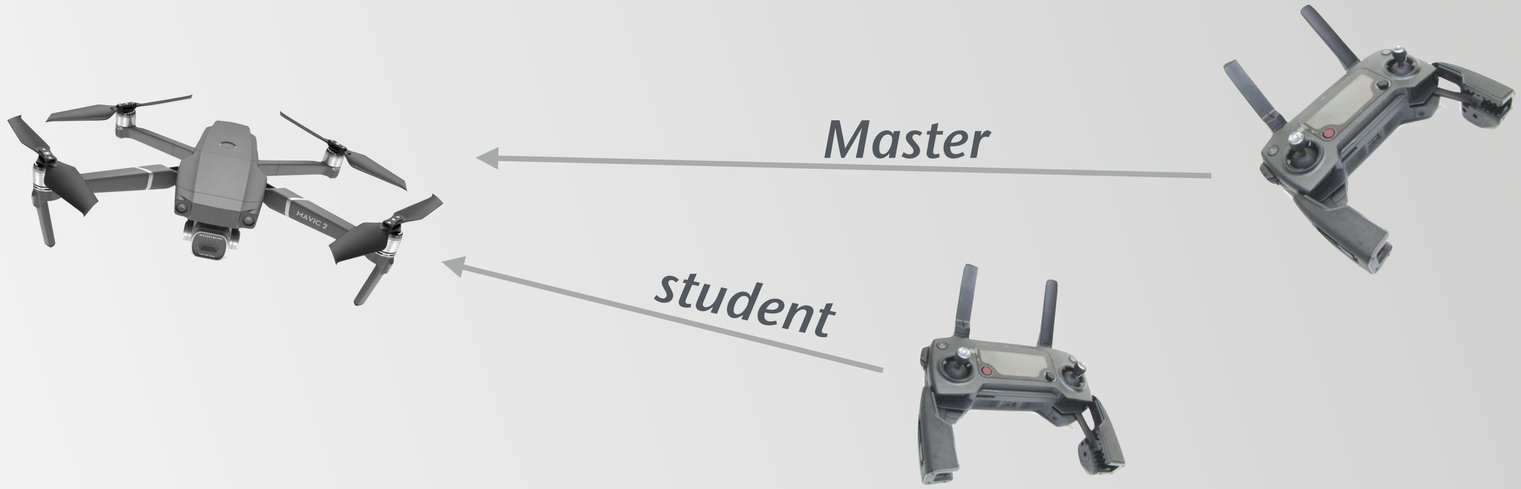
Tandem Flight Control….



A new DJI Mavic 2 Pro capability has been released…..

- *It is now possible to link 2 RC controls to a single µUAS, and use one as the "Master" and the other as "student" pilot.*
- *The Master RC can "override" and take control to stop or counter any student maneuvers at any time.*
- *This makes realtime flight training and supervision very easy and manageable.*
- *Also, the paired controllers allow one (Master) to manage the flight path, while the other controls the camera!*

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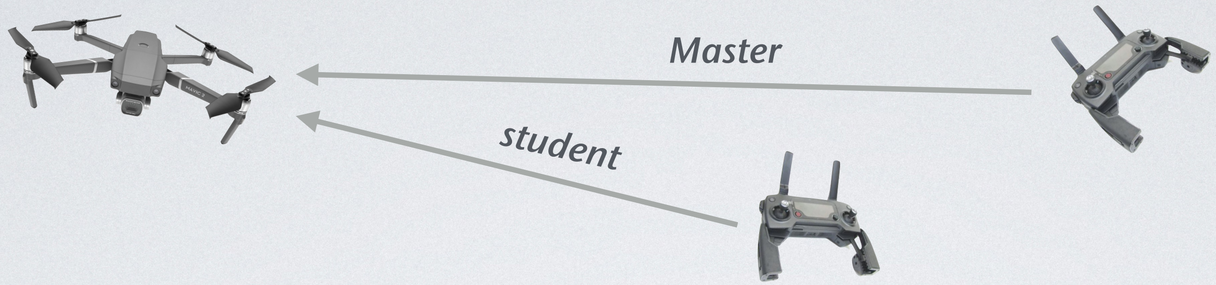
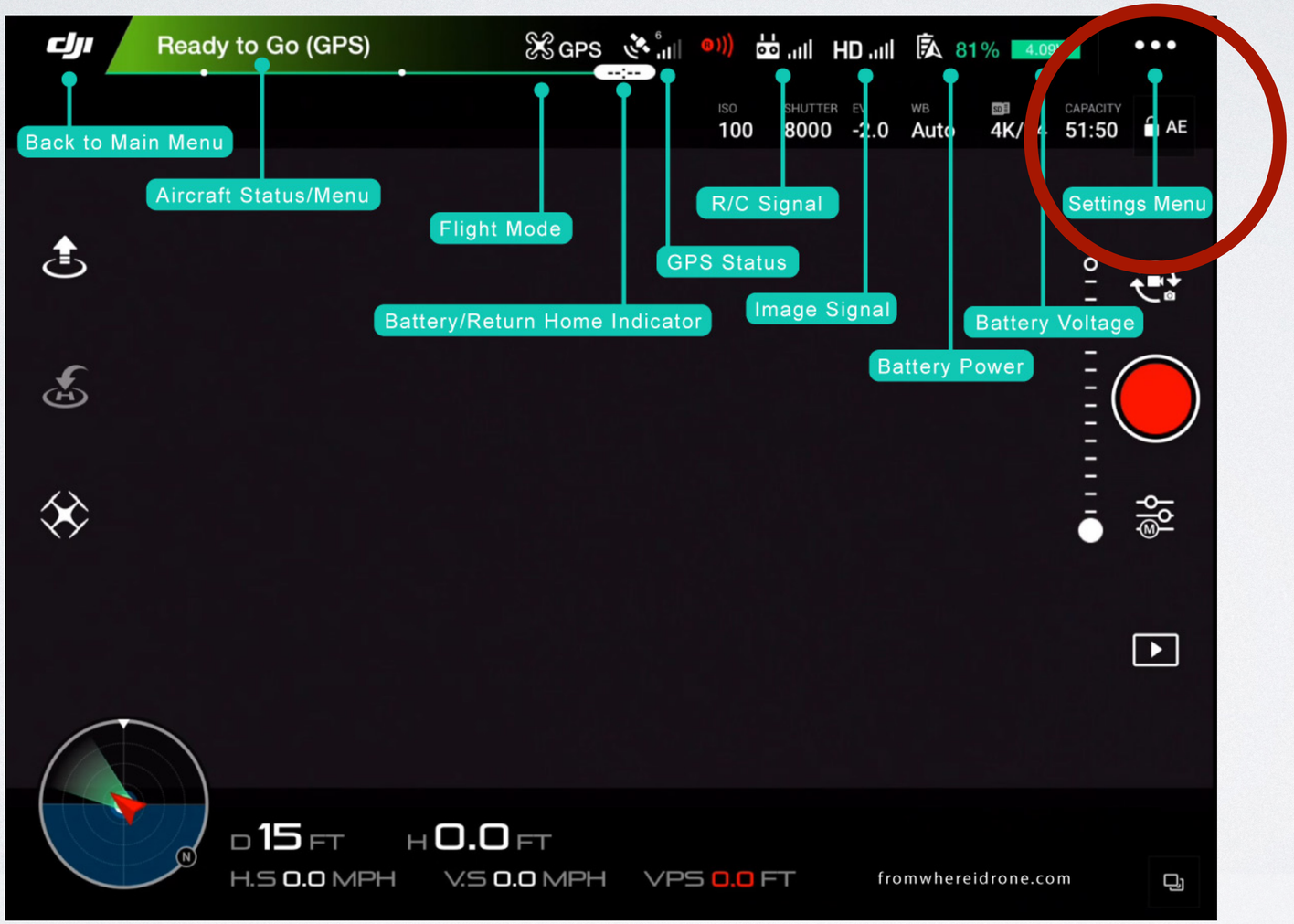
Mavic Pro RC Control screen (what you see on your connected Smart device).





What's under the "Settings Menu"!

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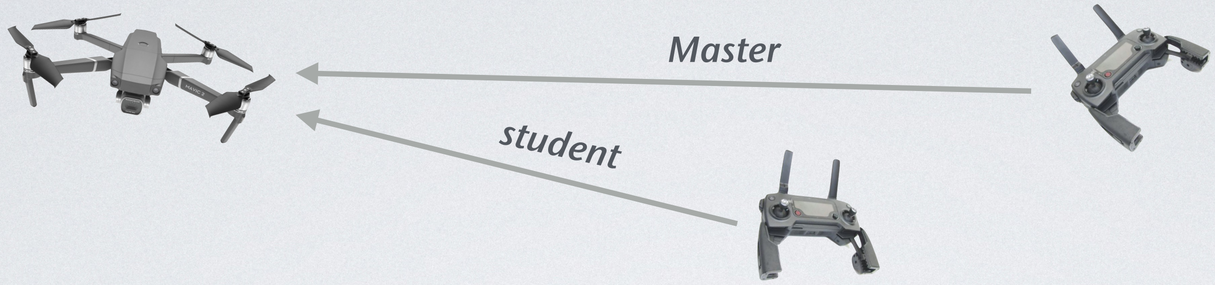
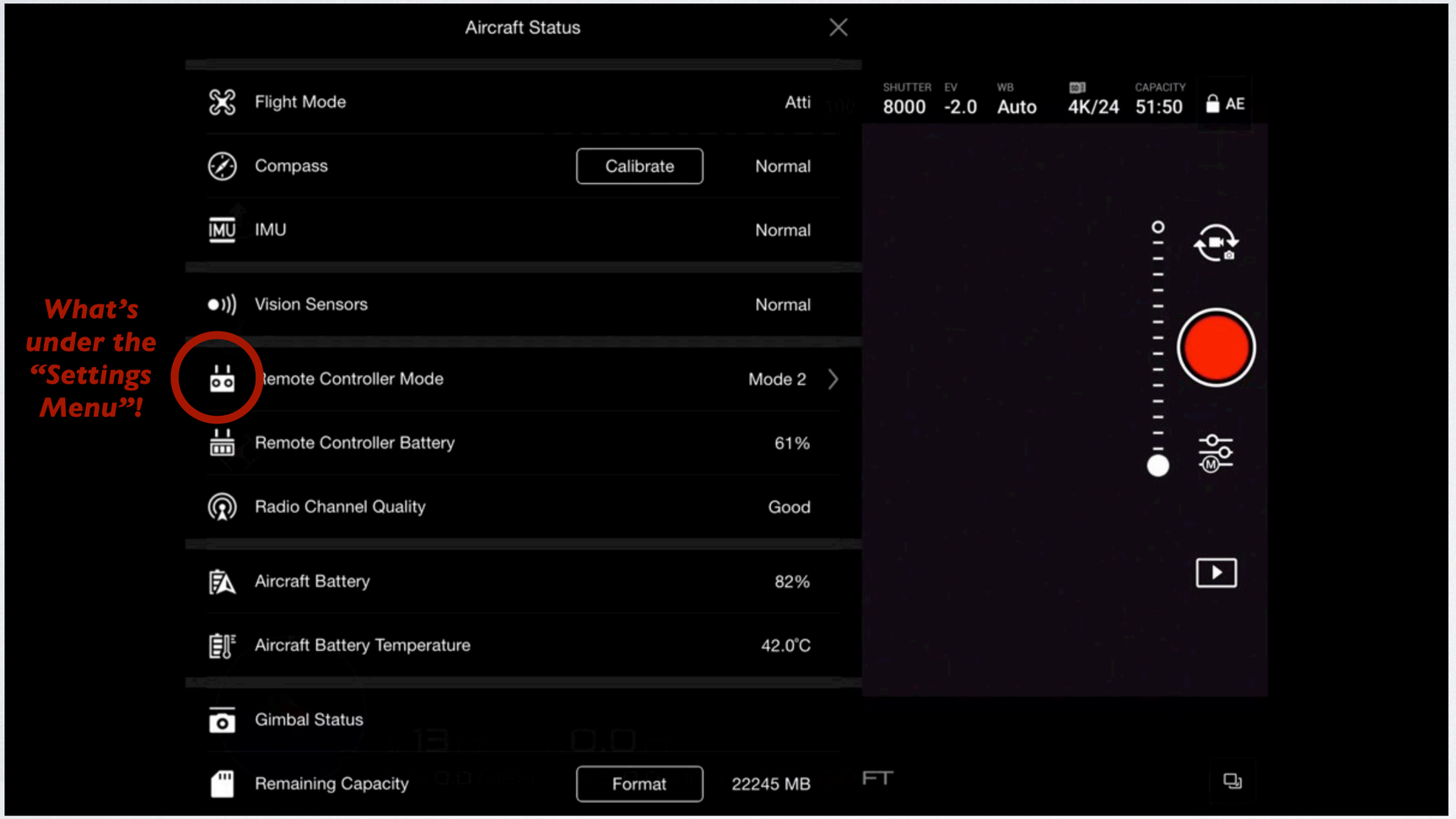
Mavic Pro RC Control screen (what you see on your connected Smart device).





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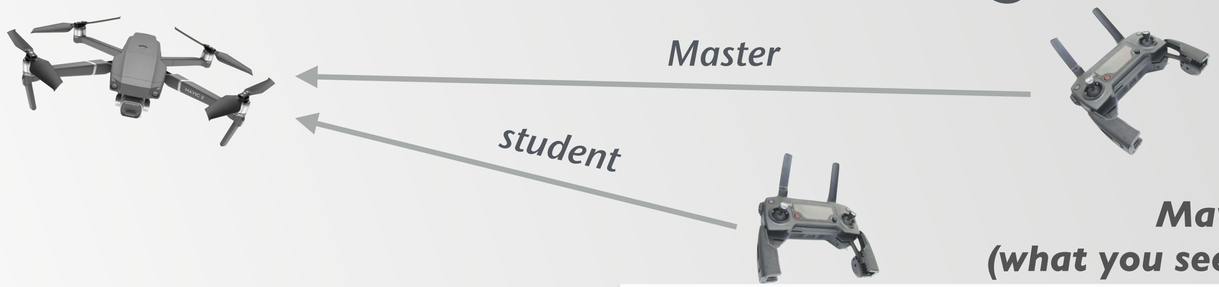
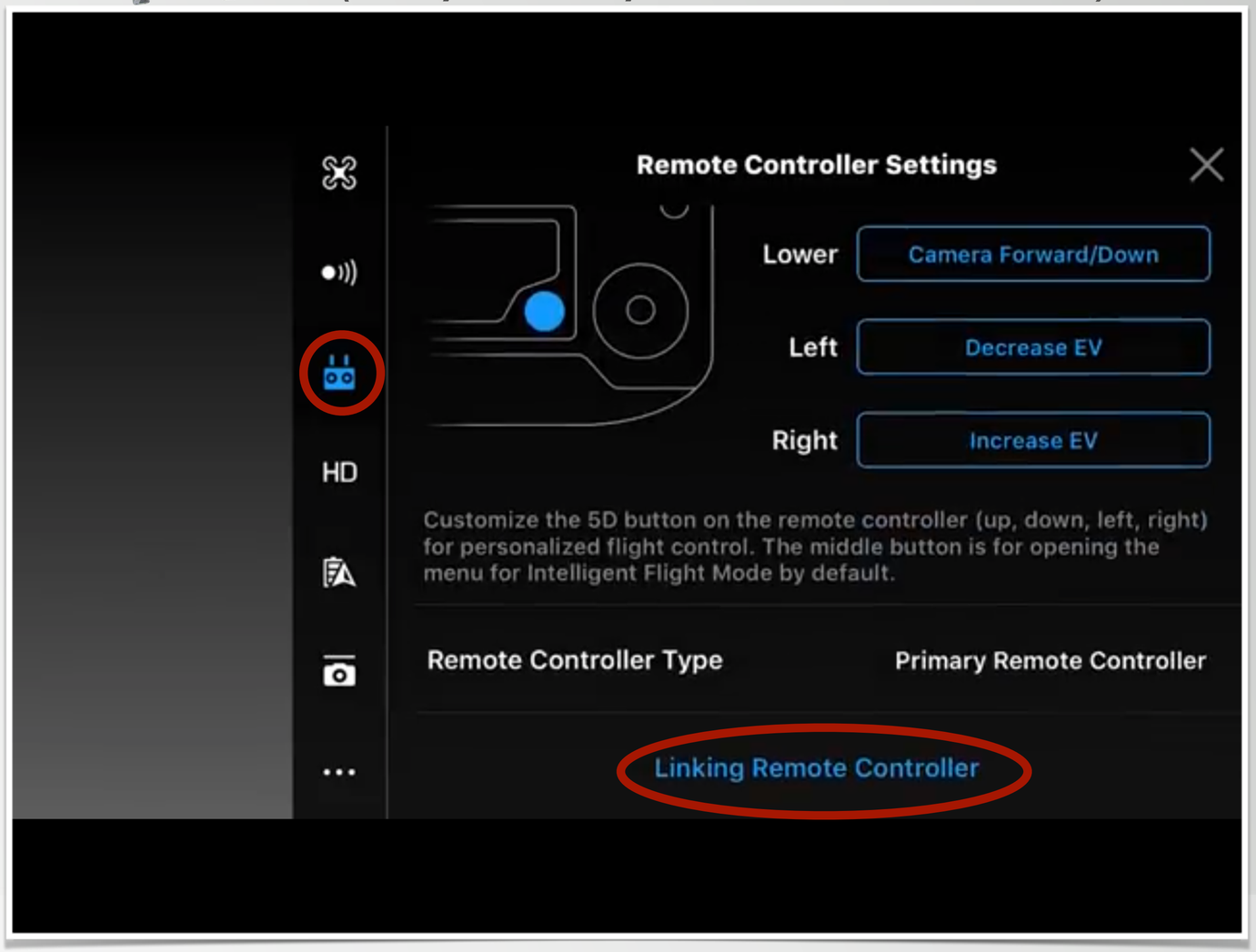
Tandem Flight Control….



Mavic Pro RC Control screen
(what you see on your connected Smart device).


Remote Controller Settings
Lower
Camera Forward/Down
Left
Decrease EV
Right
Increase EV
HD
Customize the 5D button on the remote controller (up, down, left, right) for personalized flight control. The middle button is for opening the menu for Intelligent Flight Mode by default.
Remote Controller Type
Primary Remote Controller
Linking Remote Controller

A new DJI Mavic 2 Pro capability has been released…..

- *To Set Up Dual Flight Control (Master and Student modes): Select the "Settings Menu" and then the RC icon and "Link Remote Controller".*

What's under the "Settings Menu"!

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Tandem Flight Control….

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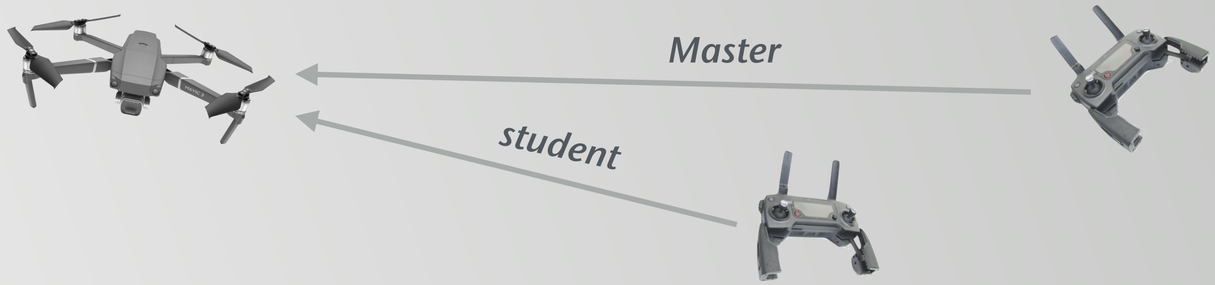
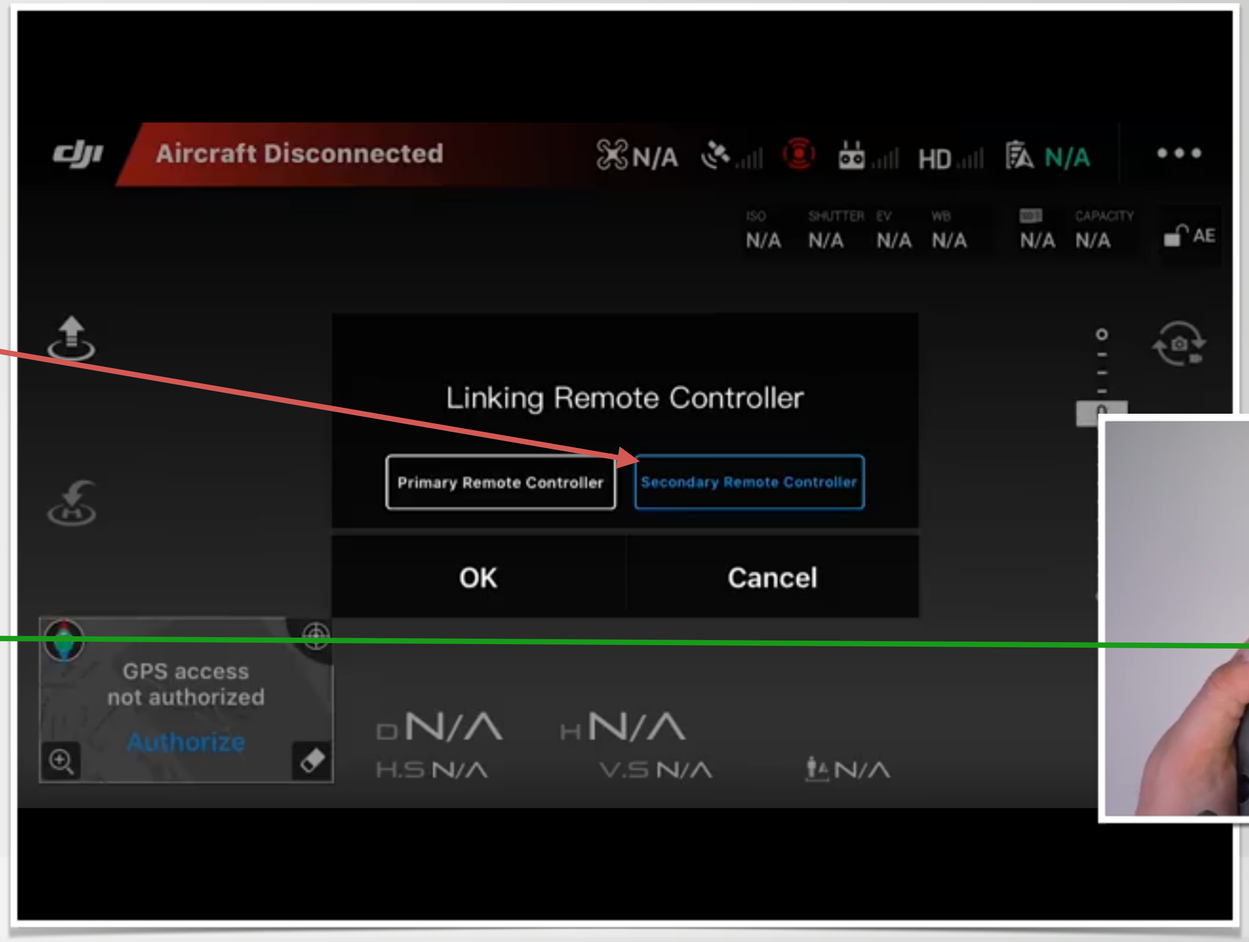


A new DJI Mavic 2 Pro capability has been released…..

- *To Set Up Dual Flight Control (Master and Student modes): Select the "Settings Menu" and then the RC icon and "Link Remote Controller".*
- *On the "Student" RC choose "Secondary Remote Controller".*
- *On the Master RC choose "Primary Remote Controller".*
- *On the Mavic 2 Pro find the "linking button" on the side and press it until the link is confirmed (light turns Green).*



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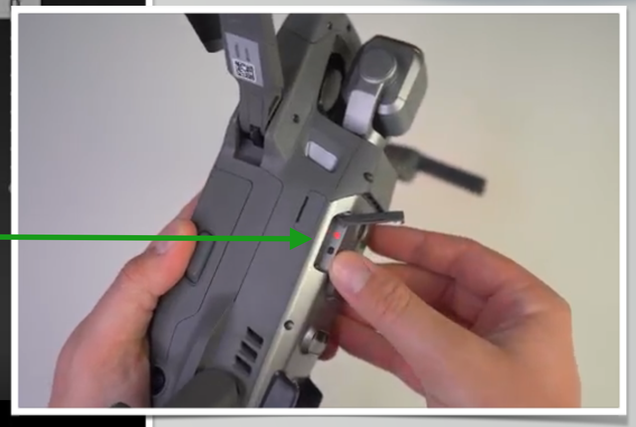

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